Unconsolidated Aquifer Systems of Johnson County, Indiana

By
Randal D. Maier
Division of Water, Resource Assessment Section
September 2005

Seven unconsolidated aquifer systems have been mapped in Johnson County: the Dissected Till and Residuum; the Pre-Wisconsin Drift; the New Castle Till; the New Castle Till Subsystem; the New Castle Complex; the White River and Tributaries Outwash; and the White River and Tributaries Outwash Subsystem. Boundaries of these aquifer systems are commonly gradational, and individual aquifers may extend across aquifer system boundaries.

The thickness of unconsolidated sediments in Johnson County is quite variable. Pre-Wisconsin glacial sediments have completely covered the entire county followed by Wisconsin glacial sediments that covered nearly all but the extreme southwestern area. Sediments that overlie bedrock range from 5 feet, in areas where only residuum or thin drift is present, to as much as 250 feet.

Regional estimates of aquifer susceptibility to contamination from the surface can differ considerably from local reality. Variations within geologic environments can cause variation in susceptibility to surface contamination. In addition, man-made structures such as poorly constructed water wells, unplugged or improperly abandoned wells, and open excavations, can provide contaminant pathways that bypass the naturally protective clays.

Dissected Till and Residuum Aquifer System

The Dissected Till and Residuum Aquifer System is mapped along portions of the western half of Johnson County, along a portion of Sugar Creek northwest of Edinburgh and in a small area of Edinburgh. It is the most limited ground-water resource of the unconsolidated aquifer systems in Johnson County.

Unconsolidated deposits of this aquifer system consist mostly of till with thin layers of stratified drift and, in some areas along the southwestern portion of the county, thin, eroded bedrock residuum. Thickness of these sediments typically range from less than 5 feet (where only residuum is present) to 50 feet. However, there are a few isolated areas where glacial deposits have filled small bedrock valleys and the thickness of sediments is greater.

Because this aquifer system is generally thin and not very productive, most drillers prefer to complete wells in the underlying bedrock aquifer. However, many large diameter bucket or cable tool type wells are successful in meeting the needs of domestic users.

Total well depths are commonly 45 to 50 feet. Aquifer materials consist of thin sand and gravel deposits that are typically less than 5 feet in thickness. Well capacities are less than 5 gallons per minute (gpm) with static water levels commonly 8 to 30 feet below surface.

Because of the low permeability of the surface materials, this aquifer system is not very susceptible to contamination from surface sources.

Pre-Wisconsin Drift Aquifer System

The Pre-Wisconsin Drift Aquifer System in Johnson County is mapped along the southeastern county boundary and extends north to include portions of Atterbury Fish and Wildlife Area and Camp Atterbury Military Reservation.

Very few records are available for wells completed in the Pre-Wisconsin Drift Aquifer System. However, a few abandoned water wells at Camp Atterbury Military Reservation, along with some seismic data, indicate thickness of unconsolidated materials up to 130 feet. Unconsolidated deposits include thick till units with multiple, discontinuous, and thin intratill sand and gravel units that typically overlie water bearing sands and gravels. Typical thickness of the aquifer units range from 1 to 10 feet.

The Pre-Wisconsin Drift Aquifer System is capable of meeting the needs of domestic users. Abandoned test wells located at Atterbury Military Reserve report well yields of 15 to 40 gpm with static water levels that range from 20 to 70 feet below land surface. However, significant drawdown is reported on some well records indicating limited yield in isolated areas.

The Pre-Wisconsin Drift Aquifer System is generally not very susceptible to surface contamination because its intratill sand and gravel units are overlain by thick till deposits.

New Castle Till Aquifer System

The New Castle Till Aquifer System in Johnson County is mapped mostly in the central and north-central portion of the county. The characteristics of this system are similar to the Pre-Wisconsin Drift Aquifer System mapped along the southeastern county boundary; however, the New Castle Till Aquifer System is mapped north of the Wisconsin glacial limit. Also, a portion of the northwest part of Johnson County was mapped as the Tipton Till Plain Aquifer System as part of the publication; “Ground Water Resources in the White and West Fork White River Basin, Indiana.” Characteristics of the New Castle Till Aquifer System and the Tipton Till Plain Aquifer System in Johnson County are also similar.

Unconsolidated deposits range from 40 feet (where bedrock is near the surface) to 250 feet (where thick glacial deposits have filled bedrock valleys). Potential aquifer materials include outwash sands and/or gravels that typically range from 10 to 15 feet thick and are generally overlain by 65 to 135 feet of clay.

The New Castle Till Aquifer System is capable of meeting the needs of domestic and some high-capacity users. Well depths generally range from 75 to 150 feet below surface. Domestic well capacities are typically 10 to 15 gpm. There are four registered significant water withdrawal facilities (6 wells) that report well capacities ranging from 70 gpm to 250 gpm. Static water levels range from 10 to 50 feet below surface with some reports of flowing wells.

The New Castle Till Aquifer System is generally not very susceptible to surface contamination because its intratill sand and gravel units are overlain by thick till deposits.

New Castle Till Aquifer Subsystem

The New Castle Till Aquifer Subsystem is mapped mostly in the central portion of Johnson County. The characteristics of the New Castle Till Aquifer Subsystem are similar to that of the New Castle Till Aquifer System. However, thickness of potential aquifer materials and potential yield is significantly less.

Typical well depths range from 50 feet to 90 feet. Potential outwash aquifer materials include thin, intratill sand and gravel deposits that range from 1 to 8 feet in thickness. The outwash aquifer deposits are capped by till generally 45 to 80 feet thick.

The New Castle Till Aquifer Subsystem is capable of meeting the needs of some domestic users. However, in some cases it is necessary for drillers to continue below the aquifer bearing zone into underlying clay deposits. This increases well capacity by allowing for extra borehole storage. Typical well yields range from 4 to 10 gpm. Static water levels are generally 10 to 35 feet below land surface.

The New Castle Till Aquifer Subsystem is generally not very susceptible to surface contamination because its intratill sand and gravel units are overlain by thick till deposits.

New Castle Complex Aquifer System

The New Castle Complex Aquifer System is mapped in portions of the eastern half of Johnson County. The system is commonly mapped adjacent to outwash aquifer systems. The New Castle Complex Aquifer System is characterized by unconsolidated deposits that are quite variable in materials and thickness. Sand and gravel aquifer deposits vary

from thin to massive and are typically overlain by a thick till. However, the system also exhibits multiple layers of outwash and till of variable thickness above the aquifer resource. Total thickness of unconsolidated deposits can be as much as 250 feet.

Typical well depths range from 60 to 125 feet. Outwash aquifer materials range from 1 to 105 feet in thickness but are typically 5 to 30 feet thick. The aquifer deposits can be overlain by till up to 215 feet thick. However, the till cap is generally 35 to 90 feet. In some areas the outwash aquifer materials are separated from upper sand and gravel deposits (not typically used as a resource) by till that commonly ranges from 10 to 40 feet thick. The upper sands and gravels are typically 2 to 20 feet thick.

The New Castle Complex is capable of meeting the needs of domestic and some high-capacity users. Typical domestic yields range from 15 to 20 gpm. Three registered significant water withdrawal facilities (5 wells) report pumping capacities that range from 70 gpm to 700 gpm. Typical static water levels range from 15 to 40 feet below surface.

The New Castle Complex Aquifer System is not very susceptible to contamination where thick clay materials overlie. However, in some areas where outwash is present at or near the surface and clay deposits are thin, the system is at moderate to high risk.

White River and Tributaries Outwash Aquifer System

The White River and Tributaries Outwash Aquifer System in Johnson County is mapped in the northwest corner along the White River; in the southwest along Indian Creek; and along most of the eastern third of the county along Hurricane Creek, Sugar Creek and the Big Blue River. This system contains large volumes of outwash and alluvial deposits that filled the river valleys of the White River and its major tributaries. As the glaciers melted, the quantity of sediment was too large for the streams to transport. As a result, the increased sediment load was stored in the valley as vertical and lateral accretionary deposits. As long as the retreating glaciers continued to provide sediment in quantities too large for the streams to transport, the main valley continued to be filled. These deposits formed the most prolific aquifer system in the county.

Total thickness of unconsolidated deposits can be as much as 165 feet with up to 110 feet of continuous sand and gravel. In some areas, however, stringers of silt, clay-sand or clay-gravel mixtures, generally 5 to 30 feet thick, disrupt the continuity of the sands and gravels. Well depths are typically 45 to 85 feet. Aquifer materials are commonly 10 to 45 feet thick and may be capped by 5 to 25 feet of clay or silt.

This system has the greatest potential of any aquifer system in Johnson County and can meet the needs of domestic and high-capacity users. Domestic well yields commonly range from 10 to 25 gpm. There are fourteen registered significant water withdrawal facilities (45 wells) in this system. Reported well capacities are up to 2700 gpm but are

typically 500 to 1500 gpm. Static water levels range from 10 to 25 feet below surface with some reports of flowing wells.

In areas that lack overlying clays, this aquifer system is highly susceptible to contamination from surface sources. Where the aquifer system is overlain by clay or silt deposits, the aquifer is moderately susceptible to surface contamination.

White River and Tributaries Outwash Aquifer Subsystem

In Johnson County the White River and Tributaries Outwash Aquifer Subsystem is mapped east of Franklin from the confluence of Hurricane Creek and Youngs Creek continuing south to the Bartholomew County line.

There are few wells available in the White River and Tributaries Outwash Aquifer Subsystem. Well depths typically range from 35 to 60 feet below surface. Sand and gravel aquifer deposits are generally 10 to 35 feet thick. The sands and gravels may also be capped by a silt or clay 5 to 20 feet thick. In a few isolated areas bedrock is shallow; some drillers bypass the unconsolidated sediments and continue to bedrock allowing for extra borehole storage. However, typical penetration of the bedrock is less than 10 feet and it is likely that the overlying sands and gravels contribute significantly to the well yield.

This aquifer system has the potential to meet the needs of domestic and some high-capacity users. Domestic well yields are typically from 10 to 25 gpm with static water levels 5 to 20 feet below surface. There is one registered significant water withdrawal facility (3 wells) in the outwash subsystem in Johnson County with reported capacities that range from 100 gpm to 450 gpm.

Areas within this aquifer system that have overlying clay or silt deposits are moderately susceptible to surface contamination; whereas, areas that lack overlying clay or silt deposits are highly susceptible to contamination.

Map Use and Disclaimer Statement

We request that the following agency be acknowledged in products derived from this map: Indiana Department of Natural Resources, Division of Water.

This map was compiled by staff of the Indiana Department of Natural Resources, Division of Water using data believed to be reasonably accurate. However, a degree of error is inherent in all maps. This product is distributed “as is” without warranties of any kind, either expressed or implied. This map is intended for use only at the published scale.